Electronic Tint on Demand for EVVA, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

The team of AlphaMicron Inc and ILC Dover propose using AMI's proprietary light control technology to provide electronic tint-on-demand for the next generation NASA Z-2 space suit. The technology is based on a guest - host liquid crystal system providing 1) electronic controlled dimming with millisecond switching speeds, 2) military grade optics, 3) customizable single color or multi-color solutions, 4) fails to clear state in less than one second, and 5) transmission window change of approximately 50%. For the Phase I program, the team is proposing a multi-pronged research and development approach to provide dimmable light control. The first approach is to thermoform dimmable liquid crystal films that match the curvature and shape of the bubble shaped inner visor of the EVVA. The second approach will be to prepare a custom eyewear with the same dimming functionality. The third path is a hybrid approach, combining the eyewear with thermoformed panels.

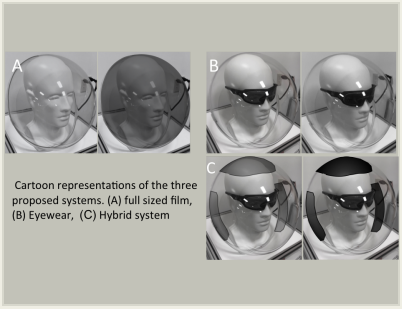
While each utilizes the same core LC technology, the different approaches carry different levels of development risk and performance benefits. The eyewear path is more technological advanced, while the full sized thermoformed film and the panel sized thermoformed films are currently at the early prototype stage of development. Given the current state of the technology. the propsed research can be completed within the six months.

With the goal of developing a technology that can be integrated into the Z-2 spacesuit preparing variations of the technology provides multiple options for NASA to evaluate and determine which best meets the needs of the astronaut.

Anticipated Benefits

In addition providing tint-on-demand for the EVVA, the light control technology featured in this proposal can be applied virtually anywhere tinting is desirable. The high optical quality of the light control films allows the technology to be used for applications including large area flat or curved windows or panels, the front shield of pilot's flight helmet, or sensor protection.

The core LC technology is already used for commercial and military products where a single curve lens can be used. However, for double curve surfaces, additional research is required to bring a device to the same performance levels. Knowledge gained during the Phase I program will provide a path to manufacturing thigh quality, thermoformed light control films for other applications, such as the front lens for the HGU 55 flight

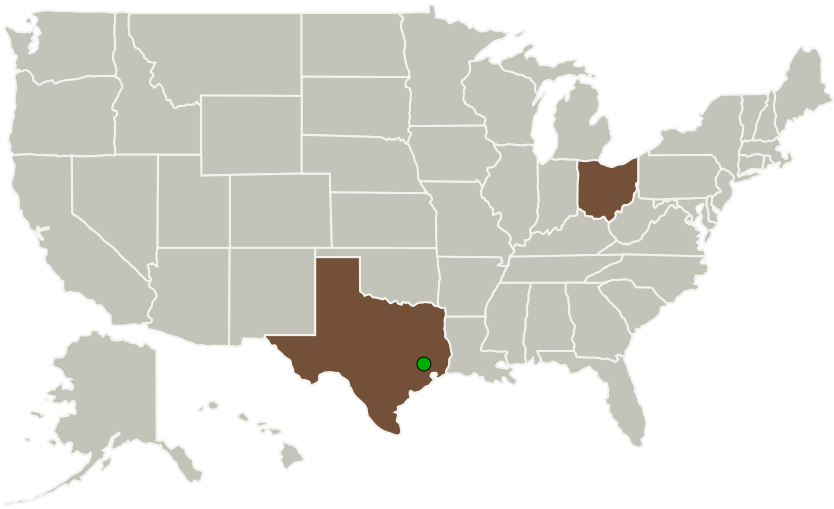


Electronic Tint on Demand for EVVA, Phase I

Table of Contents

helmets, ski goggles, or other double curve surfaces.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
AlphaMicron	Lead Organization	Industry	Kent, Ohio
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Ohio	Texas

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141332)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

AlphaMicron

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

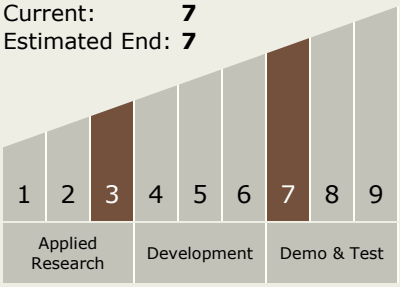
Carlos Torrez

Principal Investigator:

Paul Luchette

Technology Maturity (TRL)

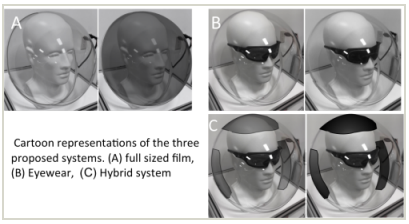
Start: **3**
Current: **7**
Estimated End: **7**



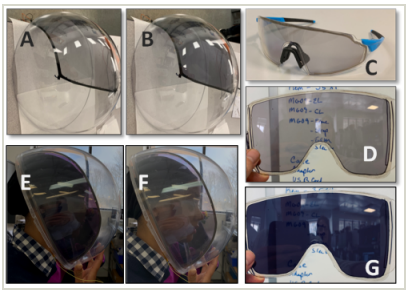
Electronic Tint on Demand for EVVA, Phase I

Completed Technology Project (2018 - 2019)

Images



Briefing Chart Image
Electronic Tint on Demand for EVVA, Phase I
(https://techport.nasa.gov/image/130554)



Final Summary Chart Image
Electronic Tint on Demand for EVVA, Phase I
(https://techport.nasa.gov/image/127327)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.2 Extravehicular Activity Systems
    - TX06.2.1 Pressure Garment

Target Destinations

The Moon, Mars, Earth